



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

# A STUDY OF THE AFFECTIVE QUALITIES.

## I. THE TRIDIMENSIONAL THEORY OF FEELING.<sup>1</sup>

By SAMUEL PERKINS HAYES, A. M., Ph. D.

### CONTENTS.

Introduction,	358
I. Harmonical experiments,	363
Observer M.,	365
Observer G.,	373
Observer C.,	374
Observer W.,	377
II. Metronome experiments,	380
Observer M.,	382
Observer G.,	384
Observer C.,	388
Conclusion,	389

### INTRODUCTION.

Wundt's theory of feeling has undergone a continuous process of development, in which three fairly distinct stages may be distinguished. In the first period "there is but one class of elements, sensations. Feeling is a third attribute of most of these, and represents their subjective aspect. More specifically, it is the mode of reaction of attention upon sensational content. The way in which a perception is taken up into consciousness at large determines feeling. Feeling thus depends on the general subjective disposition in a way which is not true of quality and intensity. Its poles are pleasantness and unpleasantness." In the second period, "quality and intensity of feeling are mentioned for the first time, and its close relation to will is emphasized. Pleasure and pain in the form of desire and repulsion govern all volition. Feeling is on the one hand inseparable from sensations and ideas, and on the other, it could not exist without a will, the tendency of which it manifests." In the third period, feelings become independent elements in consciousness: they cannot be reduced to any simpler elements; and, although we cannot isolate them directly as we can sensations, by focusing the attention upon them, we can isolate them indirectly—from each other—by isolation of their perceptual substrate.<sup>2</sup> It is in the writings of this third and

<sup>1</sup> From the Psychological Laboratory of Cornell University.

<sup>2</sup> Hollands: Wundt's Doctrine of Psychical Analysis: II, Feeling and Feeling-Analysis. *American Journal of Psychology*, XVII, 1906, 208 ff., 214.

final period that Wundt's tridimensional theory first appears.

The general outlines of the new theory are well known. Simple feelings are at once more numerous and more various than simple sensations; but they may be grouped in a tridimensional manifold, in which the various intensities of feeling are indicated by distances from the central indifference point, and the qualities of feeling by the direction from this indifferent centre. Our concrete feelings are, in the great majority of cases, compounded of all three feeling dimensions; an actual feeling that lies in one dimension only, or even in two dimensions, is an exceptional occurrence, a limiting case.<sup>1</sup> In other words, the simple feelings tend strongly to fuse; they give rise to unitary feeling resultants, which are introspectively unanalyzable as they occur. If we wish to analyze them, we must have recourse to the sort of psychophysical analysis that we employ, *e. g.*, in the case of a color sensation. By varying the components of the color stimulus, we discriminate color-tone, saturation and brightness, though the color as given is a quality of sensation, psychologically unanalyzable.<sup>2</sup> So with feeling: by varying the components of the perceptual substrate, or by varying the sensory stimulus in the case of the multidimensional sensation systems, we are able, psychophysically, to bring out the elementary components of the unitarily experienced feeling.<sup>3</sup>

The tridimensional theory first appeared in the *Grundriss der Psychologie*, 1896. In 1899 Titchener published a criticism of the theory as here formulated, maintaining that strain-relaxation and excitement-depression are not pairs of maximally opposite qualities, but rather positives and negatives; calling attention to the fact that Wundt's treatment of feeling in the *Vorlesungen* of 1897 was at variance with that of the *Grundriss*; and asserting that Wundt had presented no experimental evidence for his theory.<sup>4</sup> Wundt replied in detail to this criticism, and appealed to the curves in Lehmann's *Die körperlichen Aeusserungen psychischer Zustände* as experimental evidence.<sup>5</sup> Stevens then made a study of Lehmann's *Atlas*, and showed that the curves in question could not be regarded as evidence for the tridimensional theory.<sup>6</sup> Titchener next at-

<sup>1</sup> Phys. Psych., II, 1902, 288, 307.

<sup>2</sup> See I. M. Bentley: *American Journal of Psychology*, XIV, 1903, 92 ff.

<sup>3</sup> On this point, and on the various changes in the exposition of the tridimensional theory (changes that may be summed up as showing an increased caution in statement, and a greater readiness to admit the possibility of feeling-analysis), see Hollands: *op. cit.*, esp. 218 f.

<sup>4</sup> Zeitschrift f. Psychol., XIX, 1899, 321 ff.

<sup>5</sup> Philos. Stud., XV, 1900, 149 ff.

<sup>6</sup> *American Journal of Psychol.*, XIV, 1903, 13 ff.

tempted to submit the question to experiment, by a variation of the method of impression, and published his results in the *Wundt Festschrift*.<sup>1</sup> In these experiments the evidence, so far as it goes, is decidedly in favor of the dual, and against the tridimensional theory of feeling.

The evidence, however, does not go far enough. As the author himself points out, the number of experiments was limited, and they were made in two only, not in all three, of the Wundtian dimensions.<sup>2</sup> And this criticism has, naturally enough, been repeated by various reviewers.<sup>3</sup> The question then remains, whether or not it is worth while to extend the investigation; to increase the number of experiments, by calling in the aid of new observers, and to take into account, for one and the same set of stimuli, all three of the feeling directions. In order to answer this question, it is necessary to estimate the idea which underlay Titchener's study. That idea was two-fold; and the study appealed to two lines of evidence, objective and subjective. On the objective side, there is the appeal to the 'curves' which present in quantitative form the course of the affective judgments. No one denies the validity of pleasantness-unpleasantness as a feeling dimension: all other dimensions are matters of dispute. If, then, the resultant curves all take the form which is taken by the curves of pleasantness and unpleasantness,—if there is no specific type of curve for excitement-depression and strain-relaxation,—then we have at least an indication that pleasantness and unpleasantness are the only fundamental affective categories. Apodictic proof we most certainly have not; but the indications will be in favor of the dual theory. For it would surely be a strange thing if a given set of stimuli affected a given observer by way of excitement-depression (or strain-relaxation) precisely as it affected him by way of pleasantness-unpleasantness. Coincidence might occur here and there; but the wider the range of observers, the larger the number of stimuli employed, and the more varied the type of affective judgment, the less likely would it be, on the basis of the plural theory, that coincidence should appear. On the subjective side, again, there is the appeal to the introspection of the observers. If the observers declare that the affective judgment in terms of pleasantness-unpleasantness is direct, easy and natural, while judgment in terms of strain-relaxation and excitement-repression

<sup>1</sup> *Philos. Stud.*, XX, 1902, 382 ff.

<sup>2</sup> "Freilich ist nicht zu übersehen, dass dies Resultat bei einer zweidimensionalen Darstellungsweise und der Begrenztheit der Versuche nicht beweisend ist." *Op. cit.*, 405.

<sup>3</sup> So, e. g., Moskiewicz in *Zeitschrift f. Psychol.*, XXXIV, 1904, 314.

is forced, difficult, associatively mediated, etc., then the evidence of the method is in favor of the dual theory. And if, further, the observers state that their judgments of excitement depression and strain-relaxation, so far as they are affective judgments at all, are based upon pleasantness-unpleasantness, this evidence is proportionately strengthened. Here, also, the value of the evidence will be cumulative: the more numerous the observers, the more varied the stimuli, the more nearly exhaustive the affective categories, the more certain will the outcome be.

Unless, then, the above reasoning can be seriously impugned, —unless, that is, some better method for the investigation of the tridimensional theory can be proposed,—it would seem very much worth while to extend the experiments of the Wundt *Festschrift*.<sup>1</sup>

We are now, therefore, confronted by the problem of the choice of stimuli. Experiments made by the method of paired comparisons consume so much time that selection is necessary; it is impossible, in a single investigation, to cover a very wide field. In the earlier study, clangs and metronome beats were chosen as offering, on Wundt's own testimony, salient examples of what we may call the unorthodox feeling dimensions. Whatever else they may be, Wundt said, clangs are exciting and depressing; whatever else they may be, time-intervals are straining and relaxing. The earlier study was planned with regard to this assertion of Wundt's.<sup>2</sup> The object of the present

<sup>1</sup> Moskiewicz (*op. cit.*, 315) writes as follows. "Es hindert nichts, anzunehmen, dass trotz der Einfachheit der Reize die in uns ausgelösten Gefühle komplizierter sind, dass wir auf sie sowohl mit Lust als auch mit Erregung resp. Lösung reagieren. Es ist durchaus nicht ausgeschlossen, dass es andere Reize gibt, auf die wir nur mit Erregung oder Spannung zu reagieren imstande sind. Auch die Gleichheit der Kurven braucht nicht zu verwundern. Warum soll eine Reihe von Reizen nicht in gleicher Weise Lust und Erregung steigend auf ein und dieselbe Person einwirken können, ohne dass Lust und Erregung identisch wären?" To the first sentence it may be replied that the stimuli (clangs and metronome rhythms) were by no means simple, and that it was partly for this reason that they were selected as a means by which to test the very complexity of affective reaction which the writer assumes. To the second, it may be replied that experiments, however limited, are better than vague conjecture. After working with clangs and time-intervals, Titchener made supplementary experiments with colors (*op. cit.*, 403). What, now, may the "andere Reize" be? Certainly not tastes and smells, which are notoriously pleasant and unpleasant. What then? The suggestion, thus thrown out irresponsibly, is worth nothing, in default of definite reference. To the third and fourth sentences answer has been made in the text. The writer is attacking the objective side of Titchener's argument, and has ignored the subjective side.

<sup>2</sup> Moskiewicz declares: "es wurden nur solche Reize gewählt, die zu zwei Gefühlsdimensionen gehören" (*op. cit.*, 314). There is, we believe, nothing in Titchener's paper that could suggest this idea.

study is somewhat different; it is, to make a tridimensional test of the tridimensional theory. Nevertheless, we have, after consideration, selected the same materials to work with,—harmonical clangs and metronome beats. For one thing, it is important to repeat Titchener's experiments, and to confirm or to refute his conclusions; and repetition of the two-dimensional method is, of course, included in the application of a tridimensional method. There was here, also, the added advantage that the technique of these experiments had already been worked out in the Cornell laboratory. For another thing, the stimuli are sufficiently complex to justify the assumption of a complex affective reaction to them, if such a complex reaction occurs at all. Wundt's latest statement of his theory would seem to admit the application of the method to color;<sup>1</sup> but we had nothing to gain by having recourse to color, and a good deal to lose, if time forbade us to employ also the clangs and intervals of the earlier investigation. Lastly, there seems to be no possible objection, from Wundt's own point of view, to our selection of stimuli. "Feelings of strain and relaxation," he says, "are always connected with the processes of attention. Thus, when we expect a sense impression, we note a feeling of strain, and upon the arrival of the expected event, we note a feeling of relaxation. Both the expectation and satisfaction may be accompanied at the same time by a feeling of excitement or, under special conditions, by pleasant or unpleasant feelings."<sup>2</sup> This passage appears, in the light of the previous study, to cover the use of clangs for the production of feelings of all three dimensions. "Again, the series of pleasurable and unpleasurable feelings is united with that of feelings of strain and relaxation, in the case of the affective tones of rhythms. The regular succession of strain and relaxation in these cases is attended by pleasantness, the disturbance of this regularity, by the opposite feeling, as when we are disappointed or surprised. Then, too, under certain circumstances the feeling of rhythm may be of either an exciting or a subduing character."<sup>3</sup> This passage appears to justify the recourse to metronome intervals.

Since, then, there is no positive objection to the use of clangs and metronome beats; and since presumptive evidence in favor of such a procedure is furnished both by Wundt's general view of the affective life and by his criticism of Titchener's experiments; we take the affective efficiency of these stimuli for granted, and ask our observers to pass upon each of them judg-

---

<sup>1</sup> Hollands: *op. cit.*, 219.

<sup>2</sup> Outlines, 1902, 92.

<sup>3</sup> Outlines, 1902, 93; *cf.* Phys. Psych., II, 1902, 286.

ments in terms of all three feeling dimensions. The results of experiment are as follows.

### I. HARMONICAL EXPERIMENTS.

The method employed in these experiments was the same as that described in Titchener's article. The same harmonical and noiseless pendulum, marking seconds, were used. The 24 tones in the three octaves  $C-c$  (64-128 vs.),  $c^1-c^2$  (256-512 vs.),  $c^3-c^4$  (1,024-2,048 vs.) were combined in all possible pairs, thus making a series of 276 pairs of tones. The series was formed by chance, and then so rearranged that the same tone should never occur in two successive pairs. This series was given 12 times to each observer: 6 times upward ( $\uparrow$ ), *i. e.*, with the lower tone first, and 6 times downward ( $\downarrow$ ), *i. e.*, with the upper tone first; making a total of 3,312 experiments for each observer, exclusive of 'make-up' experiments.

In each series the observer was asked to report upon one affective quality only.<sup>1</sup>

These twelve series were given in irregular order, but not in precisely the same order to all three observers. In part of the experiments, all three observed together, sitting with their backs to the harmonical, about 2 meters from it, with screens between them. As the observers and the experimenter were engaged at different hours upon other university work, it was impossible to make the experiments at the same hour on succeeding days; but the experiments upon each particular series were made within as few days as possible, and often at the same hour on succeeding days. Two vacations occurred during the progress of these experiments, which further interrupted their regularity.<sup>2</sup> When it was possible to have only two observers at a time, the series was repeated later for the absent observer. For these reasons the 12 series could not be given to all the observers in exactly the same order. The experiments with the harmonical were made during the months of November, 1905—February, 1906, and April, May, 1906.

The observers were given slips of paper upon which to record their judgments, and were informed that they were to make series of judgments upon the relative pleasantness, etc., of the tones in the pairs given. They were instructed to listen to each tone separately, and to make their judgments without

---

<sup>1</sup> Titchener: *op. cit.*, 388.

<sup>2</sup> Titchener's experiments were made in the short summer session, when the observers could work every day. And, as is usual in the summer sessions, his observers were specializing in psychology, and had not the pressure of other work upon them. Under such conditions it is natural, as will appear to be the fact, that his curves should be somewhat more regular than those obtained in the present investigation.

bias as to which tone 'ought' to be the more pleasant or unpleasant. They were distinctly cautioned against forming any theory which might influence their judgments, as, *e. g.*, that 'all high tones are liable to be unpleasant.' After 30 to 40 pairs of tones had been given, the observers were allowed a rest of from 3 to 5 minutes, which was generally spent in ordinary conversation. They were encouraged to record introspections during this period, or at the end of the experimental hour, but were cautioned against comparing notes, or discussing results with one another.

The actual conduct of an experiment is as follows. The experimenter stands before the organ with one foot upon the raised pedal, the paper containing the series of tones in his left hand, the pendulum bob in his right. At the signal "ready," he releases the bob and presses down the first note to be sounded. After two full swings of the bob (2 seconds), he treads once quickly and once slowly upon the pedal, and keeps a strong, even tone sounding for two swings of the bob. Then, after two seconds of silence, the second tone is sounded for two seconds in the same way. An interval of from 2 to 6 seconds is allowed, between the pairs of tones, for recording the judgment. After the first two days of experimenting, an interval of from 4 to 6 seconds was found to be most comfortable for observers M. and G. Observer W. found this interval very fatiguing, and when she observed alone the interval between pairs was cut down to 2 seconds. The judgments on all the affective qualities required practically the same length of time.<sup>1</sup>

The experimenter exercised the greatest possible care to keep the tones strong and even in intensity, and to prevent noises from the mechanism of the organ. But in spite of care and practice, the pedal occasionally creaked in certain kinds of weather. In such cases, and also when other noises within or without the building disturbed the observers, a record was made of the judgments formed under these disturbed conditions, and the pairs of tones were repeated in make-up series. Practice in the experiment, however, soon developed in the observers such power of concentration that they heard no sounds but the tones, and occasionally surprised the experimenter by insisting that they had not heard noises which he

<sup>1</sup> None of the judgments exceeded the above time limits, although, as will be shown later, the judgments of the various affective dimensions presented varying degrees of difficulty. It would, of course, have been fairly easy to take approximate measurements of the actual times required for the formation of the judgments; but in view of the tentative and exploratory character of the investigation, this procedure did not appear either necessary or advisable, especially since it would have involved a complication of method both for the observers and for the experimenter.



had supposed must make it impossible for them to form a judgment upon the tones themselves.<sup>1</sup>

Certain tones in the scale were at times of different intensity from the rest;  $c$  was apt to sound suddenly and at high intensity;  $b^3$  and  $c^4$  were rather faint;  $c^3$  occasionally developed a tremolo. The pairs in which  $c^3$  sounded in this way were noted, and repeated in the make-up series. Whenever the observers thought  $b^3$  or  $c^4$  too weak, the pairs in which they occurred were repeated later. Therefore, these variations in the tones themselves can have had no appreciable influence in making the curves irregular, and may be considered negligible. The curves do, however, show quite distinctly the effect of the suddenness and intensity of the tone  $c$ , the curves being clearly deflected from their general course at this point.

Make-up series were arranged and given to the observers separately. These series consisted of (1) those pairs of tones in which the observer was unable to detect in either tone the affective quality looked for (negative cases); (2) pairs in which the observer found the quality in an equal degree in both tones, and was therefore unable to choose between them (undecided cases); (3) pairs in which the observer decided with difficulty, and even after decision was not sure that the judgment was correct (doubtful cases); and (4) pairs in the observation of which the observer was disturbed.

Observer M. is Miss E. Murray, graduate scholar in psychology. Before these experiments, M. had had 2 years' experience in the psychological laboratory. She was familiar with Wundt's tridimensional theory of the affective qualities, but had not read Titchener's article, and had only a vague idea of the purpose of these experiments. M. is musical.

The experiments were made in the following order:  $P\uparrow$ ,  $P\downarrow$ ,  $E\uparrow$ ,  $U\uparrow$ ,  $D\uparrow$ ,  $U\downarrow$ ,  $E\downarrow$ ,  $S\uparrow$ ,  $R\downarrow$ ,  $S\downarrow$ ,  $R\uparrow$ ,  $D\uparrow$ .  $P\uparrow$  was repeated at the completion of the 12 series. In all, with make-up series, M. made 3,885 comparisons.

(1) *Pleasantness*.<sup>2</sup> After the first series ( $P\uparrow$ ), M. had no

<sup>1</sup> The absence of a noiseless room in the Cornell Laboratory is justified by experiences of this kind, which show that with practice and keen attention to the problem in hand observers readily become so absorbed in their work that they are oblivious to everything except the particular stimuli upon which they are expected to react. See Titchener: *Mind*, N. S., VII, 1898, 311; Wirth: *Zeits. f. Psychol.*, XXV, 1901, 129.

<sup>2</sup> Attention may here be called to a distinct difference between the  $P$ - $U$  introspections, for this and for the other observers, and the introspections with  $E$ - $D$  and  $S$ - $R$ . Throughout the investigation, it was the rule that the  $P$ - $U$  judgments were given, so to say, a smattering of ultimate fact, without possibility of further analysis: the analytical introspections, bearing, *e. g.*, upon the organic reaction set up

particular difficulty in deciding which of two tones was the more pleasant. In the first series ( $P\uparrow$ ), the observer was so new to the experiment that she was easily distracted. The occasional creaking of the pedal of the organ and various noises outside the building often prevented her from forming any judgment upon the tones given. On the second day of experiment, M. reported both tones unpleasant in 12 out of the 56 pairs of tones given, and at the end of the hour said she had felt tired and stupid and had had great difficulty in keeping her attention upon the work. M. also thought that the musical interval formed by the notes influenced her judgment; when the second note made a pleasant interval with the first, its intrinsic pleasantness was increased, and so it was reported the more pleasant of the two, and conversely. In series  $P\uparrow$ ,  $c^8$  did not respond normally, but gave a tremolo effect. This was remedied before the next series of experiments. For these reasons it seemed best to regard this series ( $P\uparrow$ ) as a practice series, and to repeat it after the completion of the other experiments.

In the series  $P\downarrow$  both tones were reported unpleasant in 11 only out of the 276 pairs of tones. In 14 cases the tones were reported equally pleasant. In 2 cases M. thought that the interval formed by the two tones influenced her judgment. These pairs were repeated, after the completion of the series, and judgments were obtained in all but two cases. No distractions were reported.

Tones *C*, *D*, *F*, and *G* were each reported once as "funny," and *D* once as "amusing." *D* and *A* were each once said to give M. "cold shivers." Such associations were not encouraged, and were not reported after this series.<sup>1</sup>

---

by the stimulus, are the exception and not the rule. For the remaining feeling dimensions, the contrary is true: analytical introspections were the rule. We have set down, in summary, all the introspective material at our disposal. But it must be said, and said emphatically, that the *P-U* introspections do not represent the normal course of the experiments, as the *E-D* and *S-R* introspections do. Ordinarily, the observers termed a stimulus pleasant or unpleasant as directly and finally as they might term it red or sweet. When, therefore, the assertion is made, in the individual summaries printed below, that the *P-U* judgments were direct and immediate, this statement must not be regarded as conflicting with the introspective records; it is a statement based upon the general trend of the work, and so upon experiments from which the introspective harvest was exceedingly scanty. On the other hand, the introspections for *E-D* and *S-R* may be considered as typical of the general course of the investigation.

<sup>1</sup> This rapid decrease of associations in experiments upon affection has been noted before. Titchener calls attention to it (*op. cit.*, 403), and quotes a passage from Cohn (Phil. Stud., X, 1894, 565, 596) in which this investigator recorded the same tendency. Observers G. and W. also reported associations during the first few hours of experimentation, but soon ceased to experience them.

M. reported that the tones of the highest octave ( $c^3$ - $c^4$ ) were harsh and straining, and these were the tones oftenest judged unpleasant. During the first series ( $P\uparrow$ ) she said that they were "as unpleasant as quinine," and made her feel "all screwed up;" that it was very hard to keep her attention on the harsh high tones, and that they sometimes pained her ears; that they did not seem to spread out and give a general reverberation, but remained localized in the ears. In this series M. reported that the high tones gave her "a feeling of revulsion."<sup>1</sup>

(2) *Unpleasantness*. This series was made during the second month of experimenting. No distractions or associations were reported, nor did M. say that any of her judgments were influenced by the musical interval formed by the two tones.

In 27 pairs, both tones were reported pleasant, only one of these pairs being in the highest octave. M. reported that the high tones were very unpleasant. In 7 cases both tones were reported equally unpleasant.

M. described the unpleasantness as "usually a matter of discomfort in the head."

During the series  $U\downarrow$ , M. reported that none except the high tones were in themselves unpleasant. The others could be judged unpleasant only by comparing them with pleasanter tones. On the very rare occasions when there was a sensible difference of intensity, the louder tone seemed the more unpleasant. In 10 cases both tones were reported pleasant, only 2 of these pairs being in the highest octave; in 28 other cases the tones seemed equally unpleasant.

$P\downarrow$  was a repetition of the first series. M. said that it was difficult to disregard the influence of the musical interval. She

<sup>1</sup> The word "feeling" here and in similar instances hereafter is not intended by the observers to express any definite affective quality, but represents a loose use of the word common in conversational English, as well as in the earlier English psychology, in which it covers any mental state or process which is difficult of analysis. "It is plain," says Ward (*Encyclopædia Britannica*, XX, 40), "that further definition is requisite for a word that may mean (a) a touch, as feeling of roughness; (b) an organic sensation, as feeling of hunger; (c) an emotion, as feeling of anger; (d) feeling proper, as pleasure or pain." Common usage goes much farther. We can easily *feel* the force of M.'s thought when, as below, she speaks of an "interval feeling," and later of "a sort of question and answer feeling." The present tendency among psychologists generally is to analyze these complexes, and to limit the word 'feeling' to their affective quality. Curiously enough, however, there seems to be an opposite tendency among certain recent German writers, who are introducing the use of *Bewusstseinslage* in much the same sense as our colloquial 'feeling,' thus avoiding a careful analysis of the complex experienced, and hindering the development of an exact terminology. See, e. g., Mayer and Orth, *Zeitschrift f. Psychol.*, XXVI, 1901, 6.

was quite unconscious of distractions; for instance, she had not even noticed a steam whistle blown outside the building until the experimenter called her attention to it by asking her if it had disturbed her in making her judgments. No negative cases were reported and only one doubtful case, though M. once said that the decision was often difficult where the two tones were very near together in pitch, and that she had at last, after making a choice, felt that she might perhaps as well have chosen the other tone as the more pleasant.<sup>1</sup>

(3) *Excitement*. M. had no particular difficulty in deciding which of two tones was the more exciting, though these judgments were not quite so easy as those upon *P* and *U*.

In the first series ( $E \uparrow$ ), M. defined excitement as a "feeling of muscular pull." In the series  $E \downarrow$  M. reported that the standard of judgment tended to fluctuate; sometimes excitement meant "the amount of disturbance in consciousness," sometimes "the amount of muscular response the sound seemed to demand." Sometimes the greater intensity of a tone made it more exciting;<sup>2</sup> sometimes the judgment, in spite of instructions to the contrary, was based on the relation between tones; after some tones, certain other tones seemed restful and quite lacking in excitement. M. said that sometimes she seemed to get tired of the high tones, and then none of them were exciting. She reported definitely that the feeling of *E* was unpleasant. No distractions or associations were reported. In series  $E \uparrow$  there were 7 negative and 28 undecided cases. Of the negative cases, 6 were pairs of tones within the middle octave, which, as the curves show, was the least exciting part of the whole series. In series  $E \downarrow$  there were two negative, 19 undecided and 3 doubtful cases.

(4) *Depression*. M. had great difficulty in giving these judgments. When the series  $D \uparrow$  was begun, M. reported that all the tones came as either exciting or soothing, and it was possible to get the feeling of depression only by a special effort, —by associating the idea of groaning or shuddering to the low tones. By this reading-in process, 14 low tones were judged depressing; the remaining 111 judgments made on the same day were upon the soothing quality of the tone. On the second day M. tried again to give judgments of depression (sad, melancholy). She reported: "I did not get this feeling sponta-

---

<sup>1</sup>It may be worth while to remark again that reflective judgments were not sought in these experiments. What was required and registered was the immediate reaction to the stimulus. Cf. the instructions to the observers given above. Apparently, the reflective tendency was unusual with M., for she reported only 11 doubtful cases in the whole series of 3,312 experiments.

<sup>2</sup>Note the sudden jump upward of M.'s *E*-curves at *c*.

neously, but only by trying to see how depressed I could feel while the tone was sounding. I involuntarily adopted the method of breathing out on the tone and delaying inspiration and relaxing other muscles." In this manner the two series of judgments on depression  $\uparrow$  and  $\downarrow$  were made. In series  $D \uparrow$  there were 19 negative and 14 undecided cases; in series  $D \downarrow$ , 7 negative and one undecided case. At the end of the series  $D \downarrow$ , M. reported: "the ability to annex a depressing feeling to tones seems to vary," and "it seems easier to be depressed on a high note after a number of high notes have been given."

In order to obtain comparable judgments upon the same quality on successive days, the experimenter showed M. her first introspections on depression, each time that judgments on depression were sought.<sup>1</sup>

In response to a question as to the relation of  $D$  to  $E$ , M. wrote: "I should hardly say that depression is the opposite of excitement; that is, in this series, those notes that were not depressing were not thought of as exciting or neutral but as irritating, disquieting or disturbing."

(5) *Strain*. In the first days of these experiments, M. said that the feeling of strain seemed to be merely the effort to attend to a tone, that the strain was usually unpleasant, and that when she was in doubt as to which tone was the more straining she was inclined to rely upon the unpleasantness of it. Therefore we are not surprised to find the strain curves similar to those of unpleasantness. At the end of the experiments on strain, M. reported as follows: "Straining is not a simple immediate judgment, as is the case with judgments upon  $P$  or  $U$ . I should not be able to make the judgment unless I was prepared in a special way to respond to the stimuli. I do not get any judgment on strain unless I follow the notes somehow, with inspiration or expiration, or with general muscular contraction; except in the case of high squeaking tones which give a sense of involuntary strain in the ear and head." In series  $S \uparrow$  there were 12 negative and 8 undecided pairs; in series  $S \downarrow$  there were 11 negative and 19 undecided cases.

(6) *Relaxation*. M. had great difficulty, again, in obtaining a feeling of relaxation. A trial series was given of 5 pairs

<sup>1</sup>The same plan was adopted in the experiments on strain and relaxation. These responses tended to be so artificial that there was danger that M. would forget how she obtained the judgments, and by adopting some new method for their production give a different series of judgments each day. By refreshing her memory, the whole curve for each quality was made up of responses of the same kind.—It need hardly be said that the associations involved in these judgments are of an entirely different nature from the casual and unsystematic associations referred to above as quickly disappearing in the course of affective work.

of tones  $\uparrow$ , and M. said that she had been judging them with regard to their relaxing quality. But, upon further consideration, she decided that she had been confusing relaxation with depression. A trial series of 5 tones  $\downarrow$  was then given, and as both M. and G., who was observing with her, found it much easier to judge of relaxation in the downward series, the series  $R\downarrow$  was given before the series  $R\uparrow$ .

On the first day of experimenting on relaxation M. wrote: "The drop, rather than the second tone itself, seems to be relaxing; usually there is no relaxation with the first note, unless it is very high; the negative cases seem to occur when there is no interval feeling." During the next series she wrote: "Apparently the relaxing feeling is merely the release of attention from the first note. Each pair of notes gives you a sort of question and answer feeling." The following day M. gave judgments on strain, and at the end of the hour wrote: "In making judgments on strain I realize that, in the previous judgments on relaxation, I was not judging of the affective quality of the individual notes at all—which very seldom gave anything like a feeling of relaxation—but merely on the transition from one to the other. If you do not attend to the transition or interval but to each note separately, you get either the 'straining' feeling or absence of any feeling,—not relaxation."

During the series  $R\uparrow$ , M. reported: "Relaxation seems to be similar to depression. I get the judgment 'relaxing' by trying to see how relaxed I can be while the note is sounding. Relaxation seems to be associated with a visual picture of height. It seems to require a greater effort to feel relaxed on high notes."

After the completion of both series of experiments on relaxation, M. said that the feeling of relaxation was like the muscular strain of stooping downward; that she arranged the tones in a visual line sloping downward from right to left, and that when a high was followed by a low tone she felt as if she were bending downward with the second tone; in other cases the feeling arose when tones were lower than she had expected them to be; when there was no bending with the tone, there was no feeling of relaxation.

In  $R\uparrow$  there were 12 undecided and two negative cases.

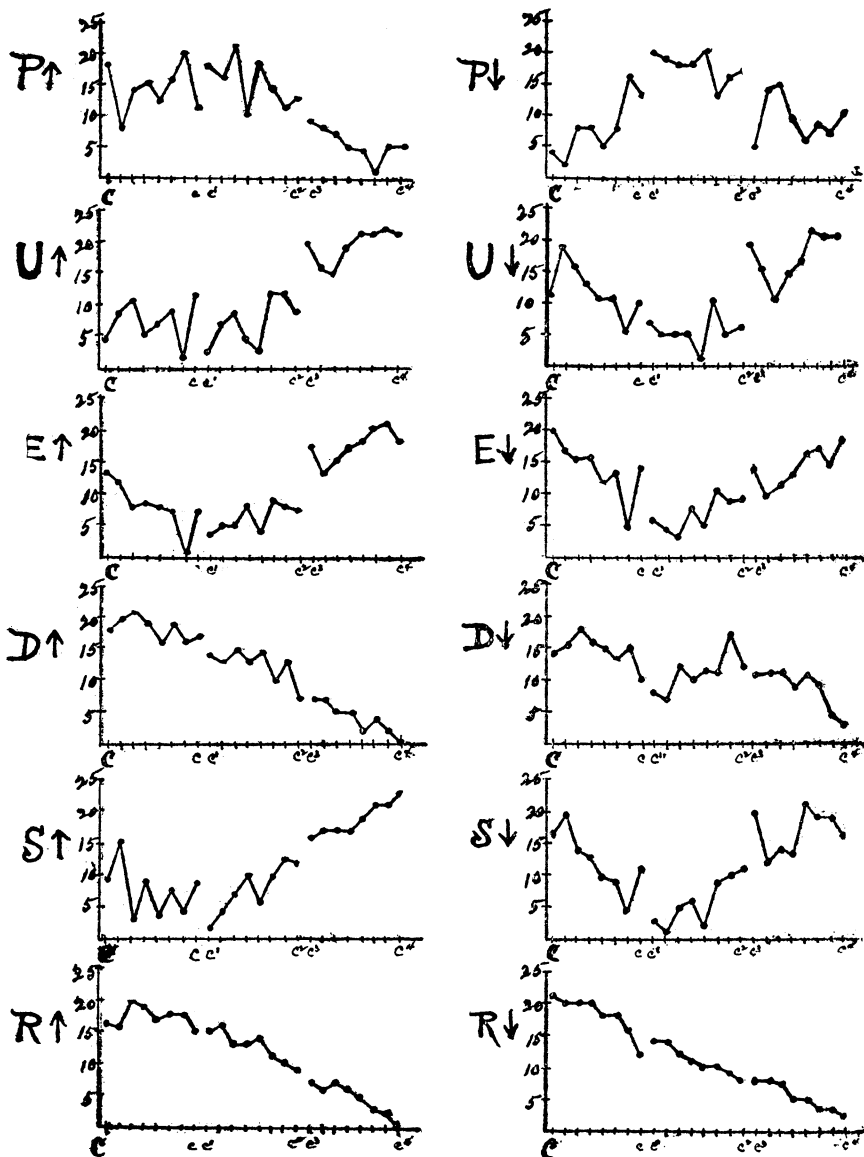
In  $R\downarrow$  there were 3 undecided and 24 negative cases.

#### SUMMARY OF RESULTS FOR M.

Putting together, now, the subjective and objective evidence to be derived from introspections and curves, we arrive at the following conclusions.

- (1) The  $P$  and  $U$  curves take typically opposite courses.
- (2) The judgments of  $P$  and  $U$  are direct or immediate

PLATE I.



judgments. This does not mean, of course, that the affective quality *always* attaches blindly, so to say, and with introspective finality to the clang. It has been sufficiently shown, *e. g.*, by Whipple's experiments, that every sensory stimulus sets up a wide-spread organic reaction, over and above the exercise of its specific influence.<sup>1</sup> At times, the organic factors are more prominent, as the sense-basis of the affective reaction, than is the clang itself. In terming the *P-U* judgments direct, therefore, we mean only that the affective quality of pleasantness or unpleasantness appears in consciousness at once as the clang-stimulus produces its conscious effect. Whether the attention is caught mainly by the clang as such (which then appears 'intrinsically' pleasant or unpleasant), or whether it is centered rather upon the muscular adjustments and organic 'sets' to which the clang stimulus necessarily gives rise (in which case these sets and adjustments appear as the immediate vehicle of the feeling),—these alternatives, however important their decision in other connections, are irrelevant for our present purpose. The point here to notice is that the *P-U* judgments are passed at once, without hesitation or reflection.

(3) No particular difficulty is experienced with the *E*-reactions. The *E*-curves closely resemble the *U*-curves, and the introspective record states definitely that excitement was unpleasant. Excitement is thus interpreted by M. as the opposite of soothing calm, quiet tranquilization; not as the opposite of depression in the sense of melancholy, sadness.

(4) On the other hand, the *D*-reactions are, precisely as in Titchener's experiments, relatively difficult. They are obtained only by setting-up and maintaining an artificial standard of judgment. The curves show an oscillatory downward course from deep to high tones; the judgments are matters of emotive association. It may be noted that, in her opposition of exciting to soothing, and depressing to irritating clangs, M. shows the same tendencies as Titchener's observers N. and second G. (*op. cit.*, 394 ff.). Her curves are of the same type as G.'s curves in Figg. 8, 11, 12 of Titchener's article. So far, therefore, we have at all points a general confirmation of Titchener's conclusions. We now come to new ground.

(5) No particular difficulty is experienced with the *S*-reactions. But the curves are very similar to the curves for *U*, and the introspections bear out the hypothesis that the affective factor in judgments of strain is the factor of unpleasantness.

(6) On the other hand, the difficulty experienced with *D* recurs with *R*. The mechanism of judgment in the two cases

<sup>1</sup> *American Journal of Psychology*, XII, 1900-1, 444.



is much the same; and the *R*-curves, like the *D*-curves, show an oscillatory downward course from deep to high tones. There can be little doubt that the curves are associative artifacts.

Observer G. is Mr. L. R. Geissler, assistant in the psychological laboratory. G. had had 2 years' experience in experimental work. He had no more definite knowledge of the purpose of the experiments than M. He also is musical.

The experiments were made first in the following order:  $P\uparrow, P\downarrow, D\uparrow, U\downarrow, E\downarrow, S\uparrow, R\uparrow, U\uparrow, S\downarrow, E\uparrow, R\downarrow, D\downarrow$ ; and then repeated in the order  $P\uparrow, E\downarrow, S\uparrow, D\uparrow, U\downarrow, R\downarrow, E\uparrow, S\downarrow, P\downarrow, D\downarrow, U\uparrow, R\uparrow$ : in all, 6,845 comparisons.

(1), (2). *Pleasantness and unpleasantness*. Although G. reported only one negative case ( $\bar{P}\uparrow$ ) in the 1,104 experiments upon *P* and *U*, he seemed at first to have difficulty in deciding which of two tones was the more pleasant or unpleasant. In the series  $P\uparrow$  he reported 63 undecided cases, in  $P\downarrow$ , 58, in  $U\uparrow$  64, and in  $U\downarrow$  21. He said that he found it difficult to choose between tones very far apart or very near together in the scale. But when these pairs were repeated later, the total of all undecided cases in *P* and *U* was reduced to 2. He reported the influence of interval on only one day. On that day he said that the succeeding tones often suggested a melody. This he found somewhat distracting, and it made the judgment of pleasantness more difficult. G. reported no other distractions or associations. He had a particular dislike for *c*, which is clearly shown in all his curves.

(3), (4). *Excitement and depression*. G. had a good deal of difficulty in experiencing the feeling of excitement, and finally concluded that "if there is anything more than unpleasantness at all" it must be the state of muscular restlessness which some tones aroused. We note that the curves of excitement and unpleasantness are almost identical.

"Depression is a vague, general feeling of quiet, letting-go, avoiding activity; one feels so lazy that it seems an unpleasant interruption to the general state of mind to have to record a judgment on the tones." This state of mind, he says, is pleasant, though depression is a rather more passive and neutral state than what he terms pleasantness. The depression curves are very similar to those of pleasantness.

(5), (6). *Strain and relaxation*. Strain and relaxation are described in muscular terms. G. has a tendency to sing the tones, and those that are within his range are easy and pleasant; those above his range are unpleasant and straining. These muscular strains are localized in the throat, face and forehead. Some, especially the very high tones, are so unpleasant that it is a constant strain to listen to them. Then

G. finds strain sensation in the ears, and various muscular contractions involved in the effort of attention. The curves bear out the close connection between strain and unpleasantness which is indicated by these introspections.

Relaxation seems to be merely the absence of the various kinds of muscular strain just enumerated. G. had great difficulty with these judgments, because he "had no standard. There was nothing but the general diffused feeling of relaxed muscles and a vague, undisturbed state of mind." This experience was generally pleasant. We note that the curves of relaxation are good opposites of those of strain, and run practically the same course as those of pleasantness.

#### SUMMARY OF RESULTS FOR G.

- (1) The  $P$ - $U$  curves show typically opposite courses.
- (2) After initial practice, the  $P$ - $U$  judgments are direct or immediate.
- (3) Excitement is with difficulty differentiated from unpleasantness, and what difference there is appears simply as a difference in the range of the organic vehicle of the feeling. The curves of  $E$  resemble the curves of  $U$ .
- (4) Depression, the given opposite of (unpleasant) excitement, is interpreted to mean soothing restfulness, undisturbed calm. It is pronounced pleasant, and the curves agree with the curves of  $P$ . The curves are of the same type as those of Titchener's first observer G. (*op. cit.*, Figg. 1-6).
- (5)  $S$  and  $R$  are described in muscular terms,  $S$  being unpleasant and  $R$  pleasant. The curves agree in general with the  $U$ - $P$  curves.

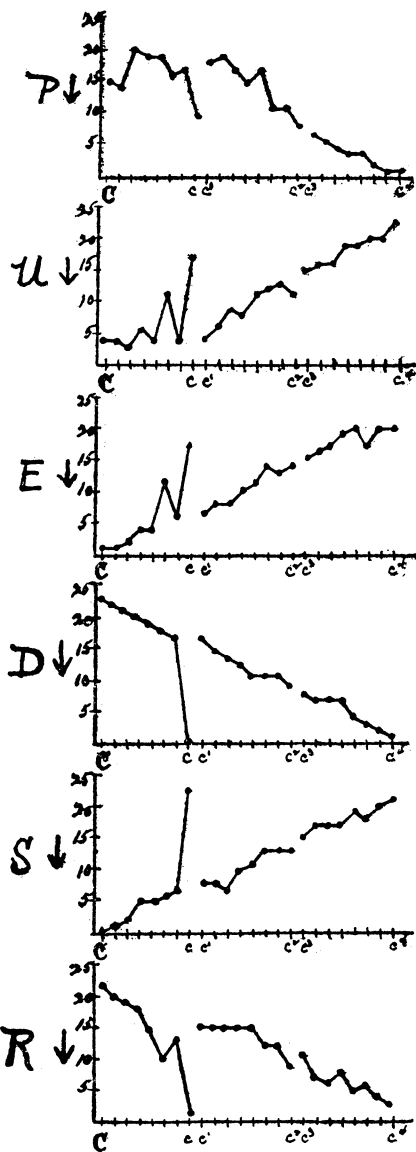
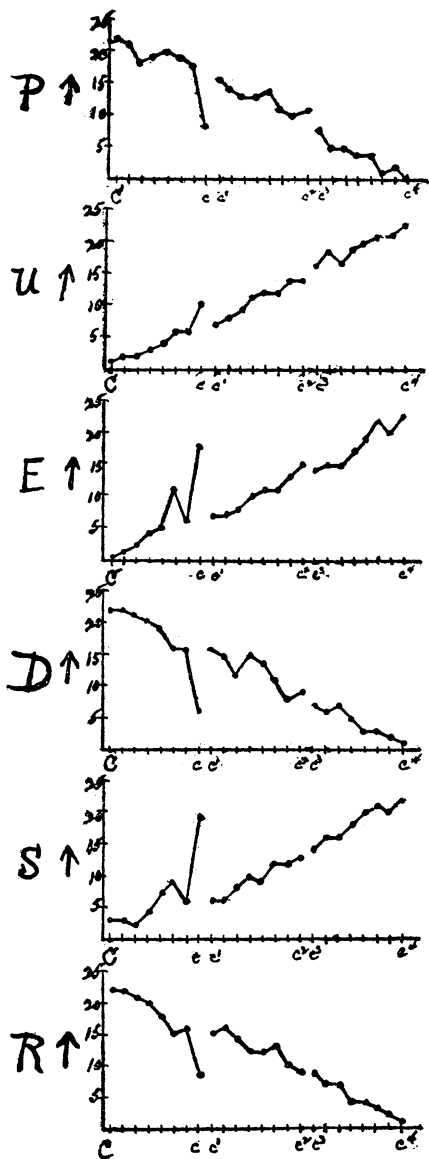
Observer C. is Mr. J. H. Coffin, assistant in the psychological laboratory. C. had had 2 years' experience in experimental work before these experiments were begun. He was familiar with Wundt's tridimensional theory, but had not read Titchener's article, and had only a general idea of the purpose of the experiments. He is musical.

The experiments were made in the following order:  $P\uparrow$ ,  $E\downarrow$ ,  $S\uparrow$ ,  $D\uparrow$ ,  $U\downarrow$ ,  $R\downarrow$ ,  $E\uparrow$ ,  $S\downarrow$ ,  $P\downarrow$ ,  $D\downarrow$ ,  $U\uparrow$ ,  $R\uparrow$ ;—3,312 comparisons.

In all the experiments with the harmonical, C. reported a constant tendency to sing the tones given. His judgments were largely dependent upon the ease or difficulty of the muscular adjustment to tones in different parts of the scale.

(1), (2). *Pleasantness* and *unpleasantness*. During the first series given ( $P\uparrow$ ), C. reported that he was influenced in his judgments by the intensity, quality, and clang-tint of the tones, and occasionally by the intervals they formed. This last he thought was due to the fact that he had a constant

PLATE II.



tendency to sing the tones. Those tones were the pleasantest which lay in the middle of his range, and could be sung most easily.

During the second series on pleasantness, C. reported that he had been noticing some organic sensations which stood out quite prominently. "The pleasant tones start a little jerk or thrill in or near my heart, which spreads upward and culminates in a sort of thrill or glow in the neck and cheeks."

C.'s judgments of unpleasantness seemed to depend upon the muscular strain involved in trying to sing tones above or below the natural range of his voice. He says that it is difficult to write introspections upon unpleasantness without using the words "muscular strain." He localizes the strain sensations in the throat, forehead and chest, and occasionally in the ears. "The more strain there is, the more unpleasant a tone is."

It will be noted that the curves bear out these introspections. It is the very high tones that are seldom chosen as pleasant, and almost always as unpleasant; the middle and lower tones are very often chosen in the *P* series and seldom in the *U* series.

(3), (4). *Excitement and depression.* The series *E*↓ was given immediately after the first series on pleasantness (*P*↑). C. noted again the constant tendency to sing the tones. "Tones that are either above or below my range seem more stirring—awaken more muscular response in both chest and throat. The excitement consists in this muscular tension or disturbance." During the series *E*↑, C. said that excitement was a "stirring or thrilling" experience, and mostly organic. C. reported that the high tones were generally unpleasantly exciting, while the low tones were sometimes pleasantly exciting. It is to be noted that the curves of excitement follow in general the course of the unpleasant curves.

C. had great difficulty in experiencing depression with the tones, and felt great uncertainty about his judgments all through the series. He said he did not think that muscular tensions had anything to do with this quality; that very low tones were depressing because they were big and heavy, and high ones because they were so little and insignificant; the low ones sometimes seemed to bear down upon him, the high ones "made him tired." Depression was generally accompanied with difficult breathing; his chest often "felt weighted." He sometimes found himself holding his breath. He reported that the depression was usually unpleasant, though the low tones were often depressing and pleasant. He said that depression was not in any sense the opposite of excitement. We note that the curves of depression are quite similar to those of

unpleasantness, differing mainly in the fact that the tones of the lowest octave were the most depressing.

(5), (6). *Strain and relaxation.* "Strain is clearly a case of muscular tension; those tones are the most straining which require the most muscular effort to sing them." To this he adds the strain of muscular adjustment in the ears, which in the case of very high tones was quite as noticeable as the strain occasioned by the effort to sing the tones. This strain was always unpleasant. We note that the curves of strain are strikingly similar to those of unpleasantness.

Relaxation is simply the absence of strain, and is always pleasant. The *R* curves are practically the same as the *P* curves.

#### SUMMARY OF RESULTS FOR C.

(1) The *P-U* curves take typically opposite courses. They are of the type of those obtained from Titchener's second observer G.

(2) The *P-U* judgments are direct or immediate, though the spread of the organic reaction is more marked than in the cases of the previous observers.

(3) Judgments of excitement are based upon muscular tensions. In general, *E* corresponds to *U*; though the lowest tones may be pleasantly exciting. The curves bear out this introspective report. It is clear that C. did not place any definite affective value upon the term 'exciting,' but took it (as the muscular tensions suggested) now as the opposite of melancholy, now as the opposite of soothing calm.

(4) Judgments of depression are difficult and uncertain. They are based, according to the introspective report, in part upon associations, in part upon unpleasantness. The curves show the former influence in the lowest octave, the latter in the two higher octaves.

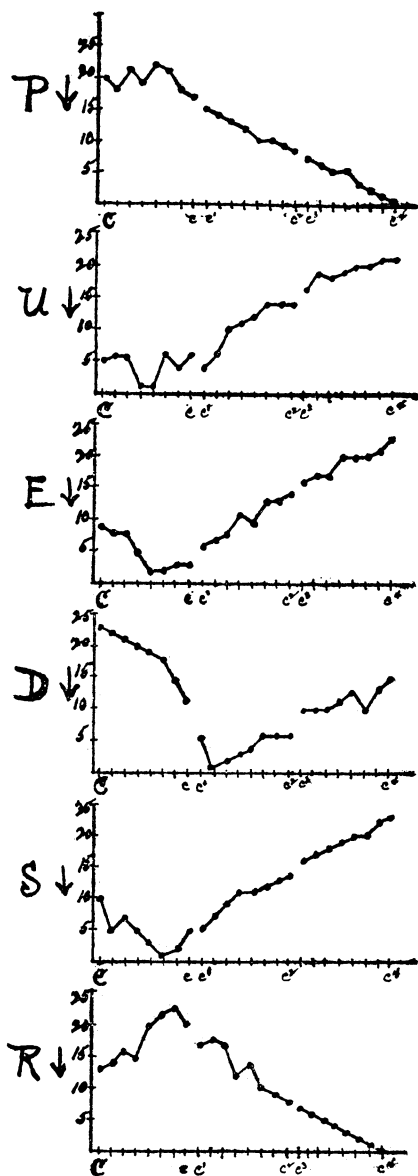
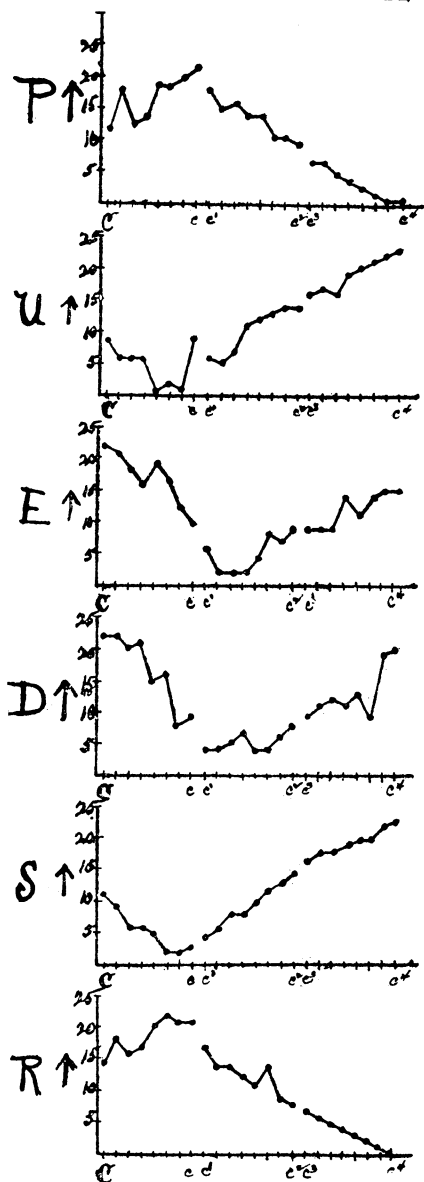
(5) Strain and relaxation are also muscular matters, and are pronounced respectively unpleasant and pleasant. The curves bear out the introspections.

Observer W. is Miss M. C. West, graduate scholar in philosophy. W. had had no experience in experimental psychology before this year, was unfamiliar with Wundt's tridimensional theory, and did not know the purpose of these experiments. She is musical.<sup>1</sup>

The experiments were first made in the following order: *P*↑, *P*↓, *D*↑, *U*↓, *E*↓, *S*↑, *R*↑, *U*↑, *S*↓, *E*↑, *R*↓, *D*↓. The curves obtained were irregular, and it seemed

<sup>1</sup> If we classify our observers as objective and subjective in type (Titchener, *Experimental Psychology*, I, ii, 1901, xxv f.), the order from objective to subjective will be: M., C., G., W.,—and the intervals will become larger as the series progresses.

PLATE III.



probable that W. had not precisely understood her instructions. Accordingly, the whole series of experiments was repeated later in the following order:  $P\uparrow$ ,  $E\downarrow$ ,  $S\uparrow$ ,  $D\uparrow$ ,  $U\downarrow$ ,  $R\downarrow$ ,  $E\uparrow$ ,  $S\downarrow$ ,  $P\downarrow$ ,  $D\downarrow$ ,  $U\uparrow$ ,  $R\uparrow$ . The curves obtained in the second series were almost as irregular as those of the first series, but showed similar tendencies. The curves published are formed by combining the four curves upon each affective dimension. W. made 6,809 comparisons.

(1), (2). *Pleasantness and unpleasantness.* These judgments were easy and immediate. In the  $P$ -series there were a good many cases in which both tones were reported unpleasant. W. was sometimes influenced by the intensities of the tones, and occasionally by the intervals they formed. Once she wrote that it was difficult "to rid the tones of ideational associations," but did not specify what these were. W. said that unpleasantness arose when the tones were harsh, rough, scraping, nasal, or shrill. She found it difficult to decide which tone was the more unpleasant when the two were widely separated on the scale.

After the first few days of experimenting, W. was not easily distracted. The loud jingling of sleigh bells, and the noise of an electric car groaning up-hill, were not even noticed.

(3), (4). *Excitement and depression.* W. reported that the exciting quality of the tones seemed to "wake her up muscularly;" that the excitement was a lively, active, motor feeling, characterized by tightening-up of the muscles and short breathing. Sometimes she noted a tightening of the ear-drums. She said that high and loud tones seemed to be most exciting; also thrilling tones, and those that reminded her of a trumpet or a horn. She found excitement pleasant rather than unpleasant, though she twice reported that unpleasant tones were occasionally exciting.

In order to get judgments upon depression, W. found it necessary to put herself in a melancholy mood; which, on some days, was difficult to do. This mood was characterized by "a constrained, paralyzing feeling," "a weight on the chest," "slow, deep breathing," "a feeling of weariness and heaviness." W. said, during the last  $D$  series, that there were two alternating elements in the mood of depression; a passive longing which was pleasant, and a feeling of fear or dread that was distinctly unpleasant.

(5), (6). *Strain and relaxation.* W. described strain in muscular terms. She reported a general feeling of tense muscles, and a contraction of the ear muscles, both accompanied by short breathing. She said that the high tones were the more straining, though occasionally low tones were straining, when they were especially intense.

Strain seemed to her always unpleasant. In fact she thought that the strain sensations were the main element in the unpleasantness of the tones.

To get the feeling of relaxation, W. found it necessary to use an artificial method similar to those used by M. in the series on *D* and *S*. "I try to take a long breath," she writes, "and, if the tone does not interfere with a good long breath and a general let-go feeling, I call it relaxing; if it makes me draw together, I call it less relaxing." "I can't relax on an unpleasant tone." Relaxation seemed to her a pleasant feeling due to the absence of muscular strains.

#### SUMMARY OF RESULTS FOR W.

(1) The *P-U* judgments are direct. The curves, though irregular, take generally opposite courses.

(2) The *E*-judgments are based upon muscular tensions. *E* is generally pleasant, sometimes unpleasant. The curve is very irregular; though it seems to resemble the *P*-curve at first, and the *U*-curve in its later course.

(3) The *D*-judgments are artificially mediated, and there seems to have been no constant standard of judgment. W. had first to 'put herself in a melancholy mood,' to pass judgment at all; and the mood, when realized, had alternations of pleasant and unpleasant phases. The curve perhaps resembles the *U*-curve at first, and the *P*-curve in its later course. It is clear, however, that W. attached no definite affective value to the terms *E* and *D*.

(4) *S* is reported unpleasant, and the *S*-curve is a very fair reproduction of the *U*-curve.

(5) The *R*-judgments are associatively mediated. On the whole, the *R*-curve bears out the introspective verdict that *R* is pleasant.

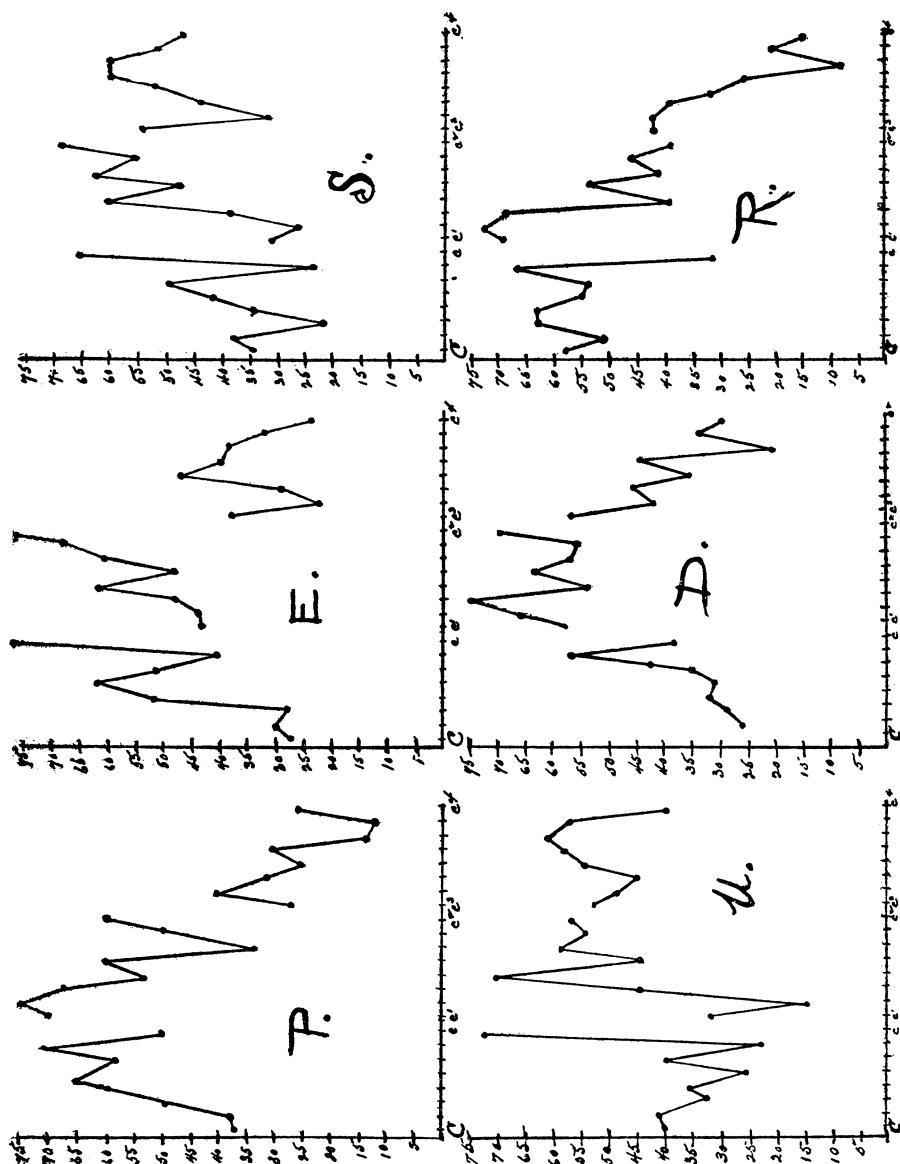
#### II. METRONOME EXPERIMENTS.

The method and apparatus used in these experiments were the same as those described in Titchener's article. Two metronomes of equal rates were placed in sound-proof boxes. From each box a rubber tube, fitted with a brass cock, carried the sound to a brass Y, whence the sound passed through a metal tube into the adjoining dark room, where it was distributed by means of a megaphone funnel.

The 14 rates used by Titchener were combined in all possible pairs, making a series of 91 tests. These rates were: 44, 50, 60, 76, 92, 108, 120, 132, 144, 152, 160, 176, 192, and 208 in the 1 min. The series was formed by chance, and then so arranged that the same rate should never occur in two successive pairs. This series of 91 pairs of rates was given 6 times, thus making a total of 546 experiments. In each pair, the



PLATE IV.



slower rate was always given first. In each series the observers were asked, as in the harmonical experiments, to judge of one affective quality only.

The experiments were made upon all three observers at the same time. The series were given in the following order : pleasantness, strain, unpleasantness, relaxation, excitement, depression. The whole series of experiments was made during the months of February and March, 1906.

The three observers, Miss Murray, Mr. Geissler and Mr. Coffin, sat about the funnel in the dark room, and as in the harmonical experiments recorded their judgments and introspections in the intervals between experiments. As before, they were instructed to make their judgments without bias, and were cautioned against comparing results. At the end of each 10 pairs of rates, a rest of from 2 to 5 minutes was allowed.

The actual conduct of the experiment is as follows. The experimenter sets the two metronomes at the proper rates, puts them in the boxes, and closes the doors. With watch in hand, he taps on the metal tube as a ready signal, and after 5 seconds opens the cock and allows the observers to hear the metronome beating at the first rate, for 7 seconds. After an interval of silence lasting for 5 seconds, he opens the second cock, and leaves it open for 7 seconds. The experimenter then rapidly sets the metronomes at the rates to be next given. This requires from 30 to 50 seconds. During this interval the observers write their judgments and introspections.

During these experiments with the metronome, the observers were much more disturbed by noises than during the harmonical experiments. As a result, it was at first often impossible for the observers to hear the stimuli at all. But, as in the harmonical experiments, they soon learned to concentrate their attention upon the metronome beats, and were less and less disturbed by noises as the experimenting went on.

At the conclusion of the 6 series of experiments, each observer was given a make-up series in which negative, undecided and doubtful pairs of rates were repeated.

#### OBSERVER M. 595 COMPARISONS.

(1), (2). *Pleasantness* and *unpleasantness*. Series *P* was the first made. M. twice reported that the sound was so faint that she had to keep uncomfortably still to hear the beats at slow rates. This effort, and the suspense accompanying the uncertainty whether or not the stimulus was still sounding, sometimes made the slow rates seem unpleasant ; and in three cases this faintness was made the basis of judgment of unpleasantness. M. often found herself making an effort to accommodate her breathing to the slower rates ; then the ease with which

she could make this accommodation determined the pleasantness or unpleasantness of the rates. Rapid rates often made her head throb unpleasantly, and sometimes gave her "an uncomfortable feeling in one ear." A slight difference in pitch between the two metronomes was noted on the second day of experimenting; this was made the basis of judgment in one case. On the same day she said that the rates sometimes suggested pleasant or unpleasant associations which tended to influence her decisions.

In the *P* series there were 5 negative, 5 undecided, and 3 doubtful cases; in the *U* series, 11 undecided, 2 doubtful, and no negative cases.

(3), (4). *Excitement and depression.* M. reported that in reacting to the exciting character of the rates, consciousness was completely filled with the processes (mainly muscular) involved in the excitement; that there was a succession of muscular strains "in the effort to keep up with the rate," accompanied by more or less confusion and hurry,—a sort of "driven feeling;"<sup>1</sup> that there was also "a continuous whirr in the head." The higher degrees of this experience were decidedly unpleasant. As to depression, M. writes: "I think I could not give judgments upon this unless I especially directed my attention to it beforehand, and regarded it as the opposite of excitement." In order to obtain the depressed feeling it was often necessary to call up associations. When experienced, depression was accompanied by the relaxation of certain muscles and by slow breathing; M. felt either quite indifferent to the stimulus, or was only slightly affected by it. The state in general was neither positively pleasant nor positively unpleasant, but rather indifferent.

In series *E* there were 2 negative, one doubtful and no undecided cases; in series *D* 6 negative and no undecided or doubtful cases.

(5), (6). *Strain and relaxation.* M. described the feeling of strain as a "general muscular tension, due to a rigid attitude." One day this strain seemed to be localized in her forehead. It was accompanied by a breathless feeling. She was "completely absorbed in following the stimulus." Consciousness seemed crowded, so that there was no room for associations. On another day she thought the strain localized in her ears; it accompanied each stroke of the metronome, but disappeared at the least relaxation of the attention. The strain often grew less after the first few beats of a group. She reported that the feeling of strain was generally unpleasant. The second metronome seemed at times to her to be of a slightly

---

<sup>1</sup> 'Feeling' in the general sense of *Bewusstseinslage*.

higher pitch; this, she thought, increased the straining quality of the beats.

M. describes relaxation as a pleasant feeling, with no confusion or effort. The rates which were accompanied by relaxation were those which could be easily followed with the throat muscles, or did not conflict with an easy rate of breathing. Relaxation seemed to be the opposite of excitement as well as of strain. She said that the "whirr in the head" noted above under excitement was quite lacking.

In the series *S*, there were 1 negative, 9 undecided, and 2 doubtful cases; in the series *R*, 1 undecided, 1 doubtful and no negative cases.

#### SUMMARY OF RESULTS FOR M.

(1) The *P* and *U* curves take roughly opposite courses. In general type they resemble the curves of Titchener's observers M. and D. (*op. cit.*, 400).

(2) Judgments of *P* and *U* were direct or immediate. The organic factors in the sensory vehicle of the feeling were often prominent.

(3) In the case of *E* and *D*, judgment was passed mainly in terms of sensation ('muscular' sensations, in the widest sense of that phrase). We find, accordingly, that the curves tend to take a straight course, the quickest rates being the most exciting, and the slowest the most depressing. Increase of *E* is unpleasant, and the latter half of the *E*-curve shows a similar course to that of the *U*-curve. The *D*-judgments are difficult; they are regarded merely as the logical opposite of the *E*-judgments, and are often mediated by association. No constancy of affective tone is reported. It must, therefore, probably be concluded that this curve is an associative artifact.

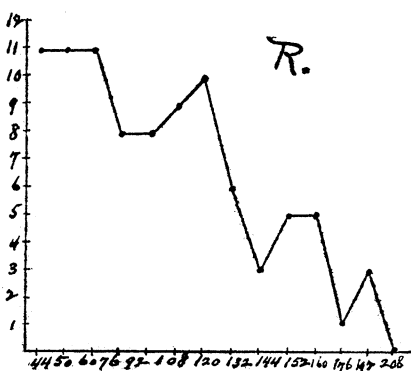
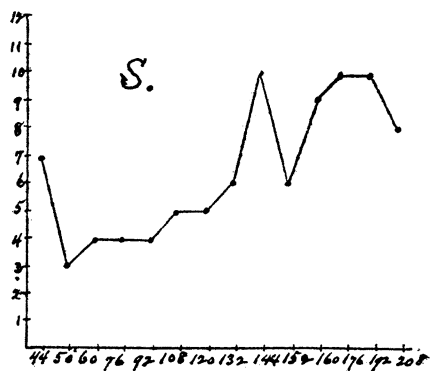
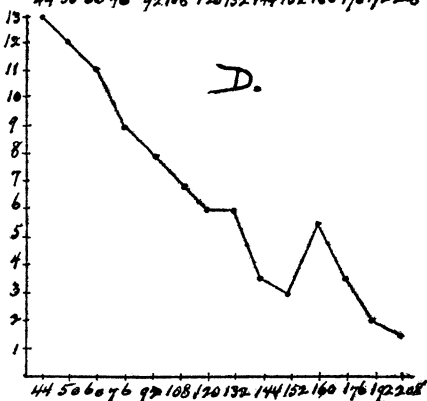
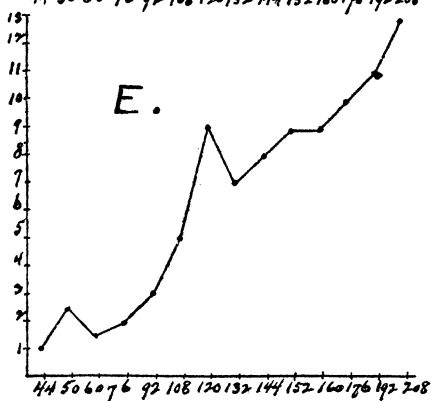
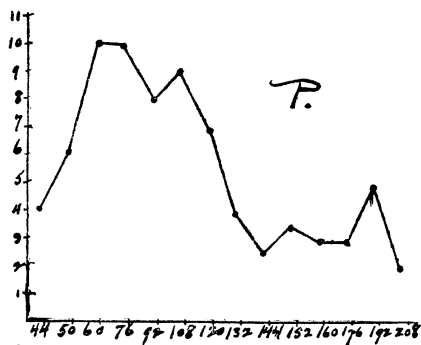
(4) Judgments of strain and relaxation were easy and direct. The introspections resemble those given for *P* and *U*, and the curves (as in Titchener's experiments) accord well with the curves for *P* and *U*.

(5) Neither in the *E-D* nor in the *S-R* experiments is there evidence of any affective factor other than *P-U*. It is noteworthy that M. regards *R* as the opposite both of *S* and of *E*.

#### OBSERVER G. 606 COMPARISONS.

(1), (2). *Pleasantness and unpleasantness.* With the slow rates, G. had a feeling of strained expectation or suspense, which made them seem unpleasant. Very rapid rates gave him an uncomfortable, hurried feeling. "It is," he writes, "always unpleasant for me to be hurried faster than I want to go." In cases where the two rates were nearly equal, he

PLATE V.



found it impossible to decide which was the more pleasant or unpleasant without the help of associations. During the first two days, G. said he could detect no difference in rate between the following pairs: 50 and 60, 60 and 76, 92 and 108, 120 and 132, 144 and 152, 152 and 160, 176 and 192. G. reported a slight occasional difference in pitch between the two metronomes, which sometimes influenced his judgments. During the experiments upon excitement, G. reported that when the slow rates approximated his natural rate of breathing, they seemed decidedly pleasant.

In series *P* there were 7 doubtful, no negative, and no undecided cases; in series *U*, 2 negative, 16 undecided and 2 doubtful cases.

(3), (4). *Excitement and depression.* G. seems to have made his judgments upon these two qualities principally by the help of the train of ideas suggested by the rates. The faster rates suggested horses racing, rapid musical compositions, etc.; the slower, bad weather, funeral marches, etc. Without the help of these associations he was unable to feel either excited or depressed. He described the feeling of excitement as muscular restlessness attended by "a restlessness of mind" in which these associations rapidly succeeded one another. The higher degrees of excitement were unpleasant.

In the series *D*, G. chose the first rate of the pair every time, as if he had decided beforehand that slow rates must be the more depressing. No negative, undecided or doubtful cases were reported in either series.

(5), (6). *Strain and relaxation.* On the first day of the strain series, G. reported a feeling of strained expectation, which was especially noticeable with the slower rates. This is the same observation as that which he made during the series *U*. Later he said that it was difficult to keep from confusing strain with unpleasantness or with the sensations of muscular tension accompanying the effort of attention. In 4 cases, both rates seemed the same (44 and 50, 50 and 60, 60 and 76, 76 and 92).

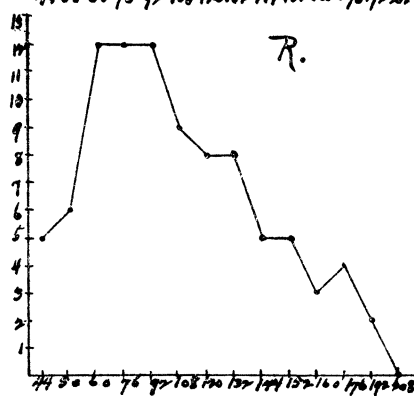
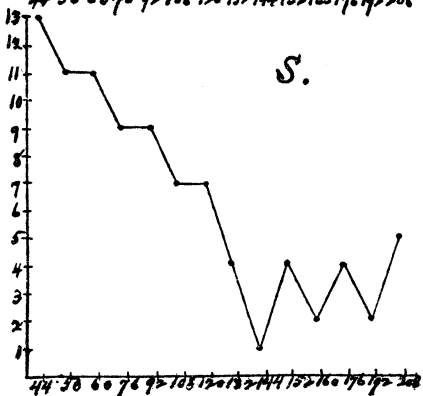
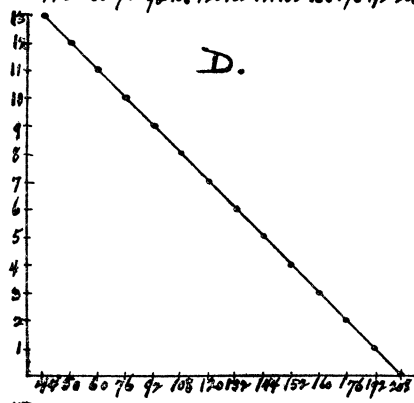
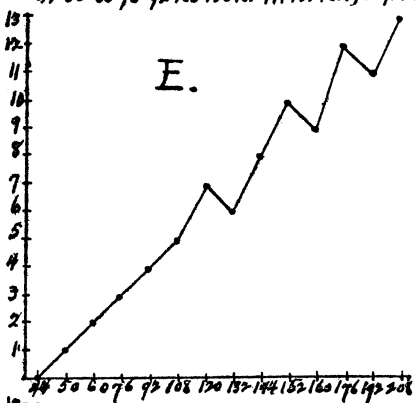
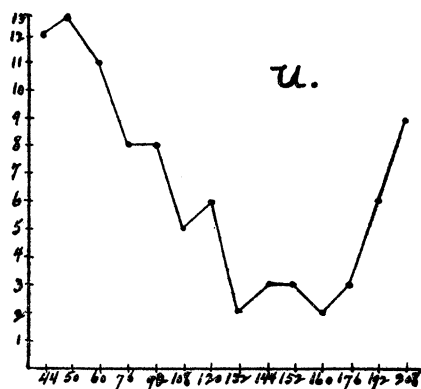
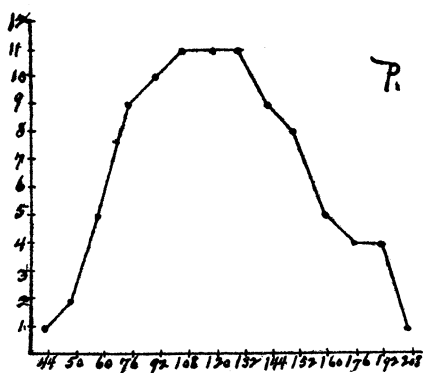
G. described relaxation in organic or muscular terms as restfulness, "settling down," quietude. This was easiest to experience with the rates of moderate speed. Very slow rates, he said, "seemed to hold him in suspense" and so made relaxation impossible.

In series *S*, there were three negative, 14 undecided, and 6 doubtful cases; in series *R*, no negative, 6 undecided and 4 doubtful cases.

#### SUMMARY OF RESULTS FOR G.

(1) The *P-U* curves take opposite courses, which agree in general type with those of the curves already mentioned.

PLATE VI.



(2) Judgments of *P-U* are direct.

(3) The *E-D* curves wear an artificial appearance, and the judgments are avowedly mediated by associations. There is no evidence of an affective factor, save that high degrees of excitement are pronounced unpleasant. The curves approximate straight lines, the highest rates being the most exciting, the slowest the most depressing.

(4) Judgments of *S* and *R* are based partly upon 'muscular' sensations, partly upon the *P-U* factors. In general the *R*-curve resembles that of *P*, the *S*-curve that of *U*. Indeed, when we consider the degree of practice implied in these experiments, we may probably say that the curves agree as well together as would pairs of *P* or of *U* curves.

In all the experiments with the metronome, C. noted a constant tendency to "keep time" with the beats by some sort of muscular movement, with the throat, feet, hands, etc., and his judgments were based upon the ease or difficulty of this procedure. C. made 556 comparisons.

(1), (2). *Pleasantness* and *unpleasantness*. These judgments were directly determined by the ease or difficulty of the muscular response to the rates. In very rapid rates, C. grouped the beats by fours and then counted one to each group, accenting the first beat. In medium rates, the single beats suggested a rhythm and the muscular response was pleasant. In two cases (pairs 144 and 152, 176 and 192) the rates seemed to be the same. Where they were widely different, he found it difficult to compare them in order to choose between them. On the first day he thought that the pleasantness or unpleasantness of the different rates depended somewhat upon his general condition: when he was sleepy, he preferred the slow; when he was wide awake, the faster were the more pleasant.

In series *P* there were 5 undecided, but no negative or doubtful cases; in series *U* there were no negative, undecided or doubtful cases.

(3), (4). *Excitement* and *depression*. During the *E* series, C. wrote: "there seems to be a rate of bodily movement which is natural and easy; the attempt to keep time with rates faster than this natural rate is exciting. Depression is merely the absence of excitement and not itself a positive quality."

"When very slow rates are given, I cannot help dividing the long interval between beats, and counting twice to a beat. In this way I obtain a rate that is twice as fast as that given and much more comfortable." No negative, undecided or doubtful cases were reported in either series.

(5), (6). *Strain* and *relaxation*. To C. strain seems to have meant the muscular tension involved in the effort to



"keep up with" the beats. The most straining rates, he says, are those "that require the most muscular tension in the effort to keep time,—those that are farthest from a natural bodily rhythm." These were unpleasant.

Relaxation was merely the absence of strain. Those rates seemed most relaxing that called forth the least muscular exertion and approximated the "natural rhythm." Relaxation was thus not differentiated from depression.

In series *S* there were no negative, 1 doubtful and 4 undecided cases; in series *R*, no negative, doubtful or undecided cases were reported.

#### SUMMARY OF RESULTS FOR C.

(1) The curves of *P* and *U* take opposite courses. The *P*-curve shows some irregularities; but the *U*-curve is more regular, and both are of the familiar type.

(2) The *P*-*U* judgments are direct.

(3) The observer shows the tendency to make the faster rates exciting, the slower rates depressing, which we have found also in *M.* and *G.* The irregularities at the beginning of the curves are apparently due to the observer's tendency to double the rates.

(4) Strain was unpleasant, and the curves of *S* and of *U* accord. *R* is identified with *D*, and the same type of curve results.

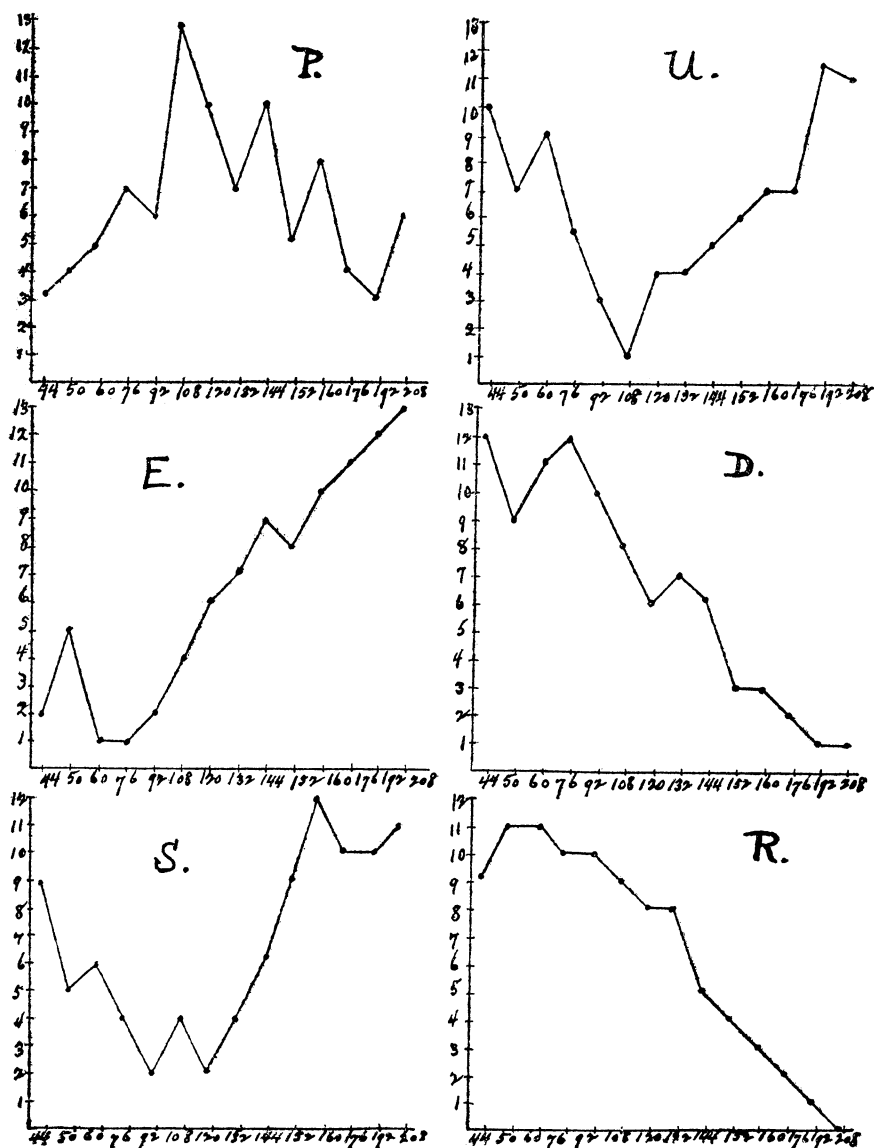
#### CONCLUSION.

We have now obtained the six series of affective judgments posited by the tridimensional theory of feeling, (1) with clangs, from four observers, and (2) with metronome intervals, from three observers. The results may be briefly summarized as follows.

(1) For all observers alike, and for both kinds of stimulation, judgments of *P* and *U* were easy, direct and natural. It was exceptional to find any reason, any basis, for these judgments: the stimuli were intrinsically pleasant and unpleasant,—more pleasant or more unpleasant than their neighbors: and where a reason or a basis was found, outside of intrinsic affective tone, it lay in the organic reaction set up by the stimulus employed. The curves of *P* and *U* followed opposed courses. There can be no doubt, then, upon any theory of feeling, as regards the validity of the *P*-*U* dimension.

(2) No evidence was obtained, throughout the investigation, of the existence of a plurality of *P* or of *U* qualities. On the contrary, *P* and *U* appeared to be homogeneous and simple, identical in all experiments. Variations in the 'color' of

## PLATE VII.



*P* and *U* were referred by the observers to variations in the organic reaction set up by the stimulus.

(3) For all observers alike, and for both kinds of stimulation, judgments of strain were easy and, on the whole, direct. Strain was, however, described in 'muscular' terms throughout, and increasing strain meant, uniformly, increasing unpleasantness. The curves of *S* correspond closely to the curves of *U*. So far as its affective side is concerned, therefore, strain may be identified with unpleasantness; there is no evidence of a new affective quality or affective dimension.

(4) Less direct, but still fairly natural, were *E*-judgments upon clangs. In the case of M. and G., excitement means unpleasant muscular tension; and the *E*-curves agree with the *U*-curves. In the case of C., excitement means, according to the nature of the muscular tensions aroused, now the opposite of melancholy, now that of calm: usually it means the latter, and is unpleasant. For W., on the contrary, *E* is usually pleasant, sometimes unpleasant. There is no evidence of a specific *E*-dimension, or of a number of different *E*-qualities. The *E*-judgments upon metronome intervals tend to be purely intellectual (sensationally motivated) and not affective judgments. Fast rates are termed exciting, slow rates depressing. High degrees of excitement are found unpleasant.

(5) Still less direct are the *D*-judgments. For M., with clangs, the whole experiment was associatively motivated, and the standard of judgment associatively maintained. We may surmise from the introspections that, had M. been asked to judge of the 'soothing' (instead of the depressing) character of the clangs, she would have given a *P*-curve as response to the instruction. For G., *D* means tranquility, soothing calm; and his curve is a *P*-curve. For C., *D* vacillates in meaning: his judgments are either associatively mediated, or judgments of *U* (depression=melancholy). For W., *D* is a still more artificial and still more vacillating term. The mood of depression is associatively aroused, and shows alternating phases of *P* and *U*. In the metronome experiments, *D* has for M. no constant affective value; the judgments are intellectual, and associatively motivated. The judgments of G. and C. do not either show any affective influence.

(6) The *R*-judgments of M. with clangs are associatively motivated: *R* is much the same as *D*. G., C. and W., on the other hand, make *R* the opposite of unpleasant strain, and accordingly give *P*-curves. In the metronome experiments, the results are the same, but their distribution is different. M. and G. give *P*-curves, making relaxation mean pleasurable muscular attitude or pleasurable organic set; C. identifies *R*

with *D*, and gives a curve similar to his *D*-curve. Nowhere is there any evidence of a specific *R*-dimension or *R*-quality.

(7) The conclusions drawn by Titchener from his two-dimensional study of the Wundtian theory are confirmed by our results.

(8) The tridimensional extension of the method of paired comparisons is justified by the directness of all *S*-reactions and of the majority of the *R*-reactions to clangs. On the other hand, the *E*-*D* experiments with metronome intervals failed entirely to elude an affective reaction, whether of the familiar *P*-*U* or of the hypothetical *E*-*D* type.

Our evidence, then, is against the tridimensional theory of feeling; it supports the dual theory in its traditional form. We have, now, no desire to press this evidence to the breaking-point. We grant freely that the experiments are not even yet very numerous; that the observers also should be increased in number; and that the range of stimuli has been limited. What we urge is, that the experiments, so far as they go, all point in the same direction. And we urge, further, that they are experiments: that our observations have been made under standard conditions, with trustworthy and conscientious observers, and by an approved method which allows of the correlation of subjective and objective results. More than this we do not assert. It may be that future investigation will show our procedure to have been too crude and general to do justice to the full complexity of factors co-operating in the affective consciousness. It may be that that subtle and intangible influence of 'laboratory atmosphere' has, in spite of all our care and of the attempted impartiality of our observers, been at work to vitiate our conclusions. We cannot disprove either of these objections, if it be brought against us. We shall be satisfied if we have shaken the pluralists, for the moment, out of their dogmatic slumber.

For the pluralistic theory may, surely, be described as a dogma. On the experimental side, appeal has been made by its representatives only to the results of the method of expression. This method has repeatedly been declared, by Wundt himself, to be subsidiary to the method of impression. That apart, however, the appeal has broken down almost as soon as made. Or is there, at the present time, any iota of evidence for the multidimensional theory to be drawn from the published investigations? The evidence seems to be found, rather, in the bias of the psychologizing mind. The affective life is extremely rich, extremely complex; and it appears, so to say, derogatory to the composition of the human mind to find the affective factors proper solely in pleasantness and

unpleasantness. When James says that the dual theory "is a hackneyed psychological doctrine, but on any theory of the seat of emotion it seems to me one of the most artificial and scholastic of the untruths that disfigure our science;"<sup>1</sup> when Ladd writes of the same theory that it is not only "wholly inadequate to describe and explain the admitted data of consciousness, but even contradictory of those data,"—that it "receives confutation at every point from the data of psychological science;"<sup>2</sup> when Wundt declares that to the observer who has freed his mind of prejudice, and who adopts the right method and principles, there "drängt sich unweigerlich eine Anzahl seelischer Zustände der Wahrnehmung auf, denen man zwar durchaus den Charakter von Gefühlen zuerkennen muss, die sich aber in die Schablone der Lust und Unlust nimmermehr einzwängen lassen;"<sup>3</sup> when Lipps postulates, besides pleasantness-unpleasantness, primary feelings of effort, of certainty, of reality:<sup>4</sup> we can understand the attitude which these authors take up, and we can give a hearty assent to their insistence upon the variety, the delicate shading, the subtle transitions of emotive experience. The question of the plurality of the affective elements *sensu stricto* is, however, a question of fact; and we have a right to demand more than casual self-observation, more even than intense psychological conviction,—we have a right to demand evidence of the combined objective and subjective sort which direct experimentation alone can furnish. So long as no attempt is made to bring such evidence, is not the pluralistic theory a dogma? Do not the differences which the different authors evince in their catalogues of the primary affective dimensions show, with all desired clearness, that the theory is a matter of personal impression and prepossession, rather than of systematic work? And may we not, with justice, challenge the partisans of the theory to take up the issue, experimentally, and at least to withhold their condemnation of the traditional view until some positive evidence for their own has been adduced?—

To us, it has seemed best, instead of extending the method of paired comparisons beyond the point now reached to other classes of stimulus, to change the venue of the problem altogether, and to attack it on the side of *mixed feelings*. A second article will therefore report an experimental study of these much-discussed processes.

---

<sup>1</sup> Psychol. Rev., i, 1894, 525.

<sup>2</sup> Psychol., descrip. and explan., 1894, 167, 169.

<sup>3</sup> Phys. Psych., ii, 1902, 285.

<sup>4</sup> Selbstbewusstsein, Empfindung und Gefühl, 1901; Vom Fühlen, Wollen und Denken, 1902.